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Nixon & Vanderhye
8th Floor
1100 North Glebe Road
Arlington, VA 22201-4714

EXAMINER	
LAVIN, CHRISTOPHER L	
ART UNIT	**PAPER NUMBER**
2621	

DATE MAILED: 03/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/069,291	NOBLE ET AL.	
	Examiner	Art Unit	
	Christopher L Lavin	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 July 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14,16-30 and 32-48* is/are rejected.

7)☒ Claim(s) *15 and 31* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *02/25/02*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Amendments

This action is responsive to the preliminary amendment received on February 25, 2002.

Specification

1. This application does not contain an abstract of the disclosure as required by 37 CFR 1.72(b). An abstract on a separate sheet is required.

Claim Rejections - 35 USC § 101

2. Claim 47 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 47 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claim 47 recites a "computer program" that imparts the method of claim 1 "when the program is run on a computer". However, the claim does not require that the program reside on a computer readable medium, or that it is actually on a computer. A "computer program" per se. is not an apparatus, method, a product or a composition of matter. Rather, a computer program is an intangible thing, and thus non-statutory. This type of information is considered "functional descriptive material" and is non-statutory per se. MPEP 2106(IV)(B)(1)(a)) states (with emphasis added),

> "Since a computer program is merely a set of instructions capable of being executed by a computer, the computer program itself is not a process and Office personnel should treat a claim for a computer program, without the computer-readable medium needed to realize the computer program's functionality, as nonstatutory functional descriptive material. When a computer program

> is claimed in a process where the computer is executing the computer program's instructions, Office personnel should treat the claim as a process claim. See paragraph IV.B.2(b), below. <u>When a computer program is recited in conjunction with a physical structure, such as a computer memory, Office personnel should treat the claim as a product claim.</u> See paragraph IV.B.2(a), below."

A computer program (or method steps performed by a computer program) IS statutory if it is claimed as being recorded on a "computer readable medium", or a "computer memory". This is which claim 48, which depends from claim 47, is NOT rejected under 35 USC 101. Therefore, the examiner suggests incorporating the limitations of claim 48 into claim 47 to overcome this rejection (and canceling claim 48). This will be assumed for examination purposes.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1 – 7, 22, 32 – 39, 40, 47, and 48 rejected under 35 U.S.C. 102(b) as being anticipated by Sheehan (5,435,310).

In regards to claim 1, A method of analyzing a sequence of images of an internal body organ in non-rigid motion, comprising the steps of: detecting the boundary, i.e., endocardium, of the organ in each image of the sequence (col. 7, lines 20 – 24); and automatically calculating the amount of movement, i.e., range of motion, through the sequence of each of a plurality of clinically significant segments of the detected boundary (col. 10, lines 4 – 8).

In regards to claim 2, A method according to claim 1, further comprising the step of displaying graphically the calculated amount of movement of each of the clinically significant segments of the detected boundary (col. 8, lines 29 – 40).

In regards to claim 3, A method according to claim 1, further comprising the step of calculating and outputting for each of the clinically significant segments of the detected boundary an average of the amount of movement of that segment (col. 8, lines 41 – 50: By finding the average between extremes for both epicardial and endocardial surfaces the average of the amount of movement for each segment is found.).

In regards to claim 4, A method according to claim 1, further comprising the step of calculating for each of the clinically significant segments of the detected boundary the variation in the amount of movement, i.e., range of motion, within the segment (col. 8, lines 38 – 40).

In regards to claim 5, A method according to claim 1, further comprising the step of calculating for each of the clinically significant segments the maximal excursion, i.e., end diastole, of the detected boundary during said non-rigid motion (col. 7, lines 36 – 37: The end diastole position of the heart is the maximal excursion, as it is the point when the left ventricle is at its maximum size.).

In regards to claim 6, A method according to claim 1, wherein the organ is the human or animal heart (col. 5, lines 52 – 66).

In regards to claim 7, A method according to claim 1, wherein the images are produced by ultrasound-based, MR-based or x-ray based, imaging or nuclear medicine (col. 5, lines 42 – 47).

In regards to claim 22, A method of analyzing a sequence of images of a deformable object in non-rigid motion to detect inner and outer boundaries of a wall of the object, comprising the steps of: detecting the inner boundary, i.e., epicardium (col. 7, lines 20 – 24); and searching outside the inner boundary for the image features representing the outer boundary, i.e., endocardium (col. 7, lines 20 – 24).

In regards to claim 32, A method according to claim 22, wherein the images are ultrasound images (col. 5, lines 49 – 51).

In regards to claim 33, A method according to claim 22, wherein the object is a human or animal organ (col. 5, lines 52 – 66).

In regards to claim 34, A method according to claim 22, wherein the object is a human or animal heart (col. 5, lines 52 – 66).

In regards to claim 35, A method according to claim 22, wherein the object is the left or right ventricle (col. 5, lines 65 – 66).

In regards to claim 36, A method according to claim 34, further comprising the step of graphically displaying the change through the sequence of the distance between the inner and outer boundaries as a representation of myocardial thickening, i.e., wall thickening (col. 8, lines 29 – 32; col. 10, lines 22 – 33).

In regards to claim 37, claim 37 is rejected for the same reasons as claim 36. The argument analogous to that presented above for claim 36 is applicable to claim 37.

In regards to claim 38, A method according to claim 37 wherein the distance between the inner and outer boundaries is averaged or integrated for within each segment (col. 8, lines 41 – 50).

In regards to claim 39, claim 39 is rejected for the same reasons as claim 36. The argument analogous to that presented above for claim 36 is applicable to claim 39.

In regards to claim 40, A method of analyzing a sequence of images of a deformable object in non-rigid motion to detect inner and outer boundaries of a wall of the object, comprising the steps of: detecting the inner boundary (col. 7, lines 20 – 24); and searching outside the inner boundary for image features representing the outer boundary, wherein the inner boundary is detected by the method of claim 1 (col. 7, lines 20 – 24).

In regards to claim 47, A computer program comprising program code means for performing the method of claim 1 when the program is run on a computer (col. 6, lines 52 – 60: Software is inherently required to performing the CPU processing disclosed by Sheehan.).

In regards to claim 48, claim 48 is rejected for the same reasons as claim 47. The argument analogous to that presented above for claim 47 is applicable to claim 48.

5. Claims 22, 26, 27, and 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Chalana ("A Multiple Active Contour Model for Cardiac Boundary Detection on EchoCardiogrphic Sequences" IEEE Transactions on Medical Imaging, vol. 15, no. 3, June 1, 1996).

In regards to claim 22, A method of analyzing a sequence of images of a deformable object in non-rigid motion to detect inner and outer boundaries of a wall of the object, comprising the steps of: detecting the inner boundary, i.e., epicardial (p. 292, Section B, first two paragraphs); and searching outside the inner boundary for the

image features representing the outer boundary, i.e., endocardial (p. 292, Section B, third paragraph).

In regards to claim 26, A method according to claim 22 wherein the step of searching outside the inner boundary for image features representing the outer boundary comprises detecting and analyzing changes in the image intensity outwards from said inner boundary (p. 292, Section B, second and third paragraph: Gradients measuring the intensity of the image pixels would be used to find the outer edge.).

In regards to claim 27, A method according to claim 26 further comprising detecting a ridge, i.e., edge, in a plot of the image intensity outwards from the inner boundary (p. 292, Section B, second and third paragraph).

In regards to claim 29, A method according to claim 26 wherein the search is conducted along a plurality of search lines spaced along and extending radially outwardly from said inner boundary (p. 292, Section B, second and third paragraph: Inherently the search would be conducted outwardly from the inner boundary to find the outer boundary. The logically approach to this would be establish search lines to search along within the Region of Interest.).

6. Claims 41 – 43 are rejected under 35 U.S.C. 102(b) as being anticipated by Jacob ("Robust Contour Tracking in Echocardiographic Sequences" Sixth Internation Conference on Computer Vision, Proceedings of IEEE 6th International Conference on Computer Vision, January 4, 1998).

In regards to claim 41, A method of analyzing a sequence of images of a deformable object in non-rigid motion comprising the steps of: detecting a boundary of

the object in each of a plurality of frames of the sequence, fitting a spline curve to the boundary in constructing a shape space representation of the movement of spline curve using a first shape space so that the spline curve tracks the boundary, and decomposing the tracking spline curve using a second different, shape space (p. 409, Section 2.1 and Section 3.1 first paragraph; p. 410 last three paragraphs in the left column).

In regards to claim 42, A method according to claim 41 wherein the first shape space is based on a principal component analysis of the movement of the boundary (p. 409, Section 3.1 first two paragraphs; p. 409, Section 2.2 last paragraph: PCA is based on the boundary which is used to analyze movement.).

In regards to claim 43, A method according to claim 41 wherein the second shape space is adapted to select a desired attribute of the motion (p. 410 last three paragraphs in the left column; p. 410 Section 3.2: A higher dimension shape space is defined which can be used to help track heart dynamics.).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 8 – 14, 17 – 20 rejected under 35 U.S.C. 103(a) as being unpatentable over Sheehan (310) in view of Jacob ("Robust Contour Tracking in Echocardiographic Sequences" Sixth Internation Conference on Computer Vision, Proceedings of IEEE 6th International Conference on Computer Vision, January 4, 1998).

In regard to claim 8, Sheehan discloses the method of claim 1, however Sheehan does not disclose using splines to track non-rigid motion of boundaries.

Jacob teaches (Section 3.1 first paragraph) that splines can be used to track the motion of the heart.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use splines to track the boundary motion of a heart (as taught by Jacob) in the method disclosed by Sheehan. As Jacob teaches (p. 408, Section 2

Theory) tracking a non-rigid object, i.e., left ventricle, using splines can help to deal with speckle noise and artifacts created in the imaging process which can lead to better analysis

In regards to claim 9, A method according to claim 8, further comprising the step of visually locating the boundary in only some selected images in the sequence and fitting the spline curve to the visually located boundary in each selected image by calculation of the control points for the spline curve (Jacob: p. 409, Section 2.2 first paragraph and Section 3.1 first paragraph: A Kalman filter framework is used to predict and locate the boundary. Jacob shows in 3.1 that the user only visually locates 4 non-consecutive cycles therefore the others most be located automatically, which must then calculate the control points.)

In regards to claim 10, A method according to claim 9 further comprising the steps of calculating a shape-space representation of the movement the spline curve through the selected images (Jacob: p. 409, Section 2.1).

In regards to claim 11, A method according to claim 10 wherein the shape-space space is calculated by performing principal component analysis (PCA) of the movement of the spline curve through the selected images (Jacob: p. 409, Section 2.1 and Section 3.1 second paragraph).

In regards to claim 12, A method according to claim 9 further comprising the steps of predicting the position of the boundary in each frame of the sequence based on the spline curve, detecting image features representative of the boundary in the vicinity of the predicated position of the boundary, and the correcting the predicated position on

the basis of the detected image features (Jacob: p. 409, Section 2.2 first paragraph: The Kalman fiter predicts the new boundary, the motion, which is then corrected based on actual measurements.).

In regards to claim 13, A method according to claim 8 further comprising the step of displaying the spline curve overlying the image (Jacob: Figure 3: The spline curve is displayed over the Echogram.).

In regards to claim 14, A method according to claim 8 further comprising the step of calculating and outputting for each of said clinically significant segments an average, i.e., mean shape, of the amount of movement of the spline curve control points for that segment (Jacob: Figure 1).

In regards to claim 17, A method according to claim 8 further comprising the step of calculating and outputting for each of said clinically significant segments a measure of the maximal excursion of the spline curve control points for that segment (col. 7, lines 36 – 37: The end diastole position of the heart is the maximal excursion, as it is the point when the left ventricle is at its maximum size.).

In regards to claim 18, A method according to claim 11, further comprising the step of defining a different shape-space space, and calculating from the spline function control points the shape-vector corresponding to the different shape-space space (Jacob: p 409, Section 2.1; p. 410, last three paragraphs in the left column; p. 410, Section 3.2: A higher dimension shape space is defined which can be used to help track heart dynamics.).

In regards to claim 19, A method according to claim 18 ,wherein a pseudo-inverse of the different shape-space space is defined to produce as components of the shape-vector a measure of the spline function control points for each of the clinically significant segments (Jacob: p. 410, last paragraph in the left column; p. 410, Section 3.2: A pseudo-inverse can be calculated for any shape space, including the different shape spaces shown in 3.2.).

In regards to claim 20, A method according to claim 19 further comprising the step of displaying graphically the variation through the sequence of the shape-vector components (Jacob: Figure 1 and 3).

9. Claims 23 – 25 and 44 – 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chalana ("A Multiple Active Contour Model for Cardiac Boundary Detection on EchoCardiogrphic Sequences" IEEE Transactions on Medical Imaging, vol. 15, no. 3, June 1, 1996) in view of Jacob ("Robust Contour Tracking in Echocardiographic Sequences" Sixth Internation Conference on Computer Vision, Proceedings of IEEE 6th International Conference on Computer Vision, January 4, 1998).

In regards to claim 23, Chalana discloses the method of claim 22, however Chalana does not disclose using splines to track non-rigid motion of boundaries.

Jacob teaches (Section 3.1 first paragraph) that splines can be used to track the motion of the heart.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use splines to track the boundary motion of a heart (as taught by

Jacob) in the method disclosed by Chalana. As Jacob teaches (p. 408, Section 2 Theory) tracking a non-rigid object, i.e., left ventricle, using splines can help to deal with speckle noise and artifacts created in the imaging process which can lead to better analysis.

In regards to claim 24, A method according to claim 23 wherein the spline curve is fitted by: manually locating the inner and outer boundaries in only some images of the sequence (Chalana: p. 294 Section III Results: The first boundary is manually identified and then the computer takes over.); calculating a shape-space space for the change through the sequence of the distance between the two boundaries (Jacob: p. 409, Section 2.1; Chalana: first paragraph of the Introduction: The B-spline taught by Jacob uses a shape-space. Chalana discloses that the regional wall thickening is measured which requires calculating the change in distance between the two boundaries.); detecting the inner boundary and performing said search outside the inner boundary for image features representing the outer boundary in images of the sequence (Chalana: page 292, Section B, first three paragraphs); and fitting a spline curve to the detected image features in said other images of the sequence by using said shape-space (Jacob: p. 409, Sections 2.1 and 3.1 first two paragraphs).

In regards to claim 25, A method according to claim 24 further comprising the step of performing a principal component analysis of the change in the distance between the two boundaries, as a basis for said shape-space space (Jacob: p. 409, Section 3.1; Chalana: first paragraph of the Introduction: Jacob shows that PCA is used to analyze the changes in the boundary. As Chalana requires two boundaries to be

tracked both would have to be analyzed using PCA to find the change in distance between the two boundaries.)

In regards to claim 44, claim 44 is rejected for the same reasons as claim 24. The argument analogous to that presented above for claim 24 is applicable to claim 44.

In regards to claim 45, A method according to claim 44 further comprising the step of fitting a spline curve to the two boundaries (Jacob: p. 409, Section 3.1 first paragraph; Chalana: Introduction: Jacob teaches of using splines to track boundaries, Chalana specifies two boundaries. So a spline curve would be used to track each boundary.)

In regards to claim 46, A method according to claim 44 further comprising the steps of finding, in all frames of the sequence, the position of the first boundary, predicting the position in all frames of the second boundary on the basis of said shape space and a search for image features representation of said second boundary (Chalana: p. 292, Section B first three paragraphs.).

10. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chalana ("A Multiple Active Contour Model for Cardiac Boundary Detection on EchoCardiogrphic Sequences" IEEE Transactions on Medical Imaging, vol. 15, no. 3, June 1, 1996) in view of Clarke (5,825,936).

In regards to claim 28, Chalana discloses the method of claim 27 for finding an edge using gradients. However, Chalana does not disclose using wavelets to find the edge.

Clarke teaches (col. 1, lines 31 – 35) that wavelets can be used for enhancement and edge detection.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use wavelets to find the outer boundary (as taught by Clarke) in the method disclosed by Chalana. Clarke teaches (col. 1, lines 35 – 40) that the motivation for using wavelets is to better preserve important clinical features.

11. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chalana ("A Multiple Active Contour Model for Cardiac Boundary Detection on EchoCardiogrphic Sequences" IEEE Transactions on Medical Imaging, vol. 15, no. 3, June 1, 1996) as modified by Jacob ("Robust Contour Tracking in Echocardiographic Sequences" Sixth Internation Conference on Computer Vision, Proceedings of IEEE 6th International Conference on Computer Vision, January 4, 1998) as applied to claim 23 above, and further in view of Foley ("Interpolation with Interval and Point Tension Controls Using Cubic Weighted v-Splines", ACM Transactions on Mathematical Software, Vol. 13, No. 1, March 1987).

In regards to claim 30, Chalana (as modified by Jacob) discloses the method of claim 23, however Chalana does not teach of how to weigh down spline control points.

Foley teaches (p. 80, final paragraph) that weighting down the spline control points can be used to deal with "tighter" curves.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to weigh down the spline control points around tight curves (as taught by Foley) in the method disclosed by Chalana. As the left ventricle has several

areas of high curvature using weighting to deal with this curvature is the easiest way to keep the spline on the boundary.

12. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sheehan (310) as modified by Jacob ("Robust Contour Tracking in Echocardiographic Sequences" Sixth Internation Conference on Computer Vision, Proceedings of IEEE 6th International Conference on Computer Vision, January 4, 1998) as applied to claim 8 above, and further in view of Baker ("Automatic Left Ventricular Feature Extraction and Visualization from Echocardiographic Images." Computers in Cardiology, US, New York , IEEE, 1996, pages 9 –12).

In regards to claim 16, Sheehan (as modified by Jacob) discloses the method of claim 8, Jacob implies (p. 408 second paragraph of the Introduction), but does not specifically teach that the variation in movement of the spline curve points is found.

However, Setarehdan teaches (p. 11, Sections 2.3 and 3) that the motion of the spline, which represents the motion of the boundary, can be measured.

Therefore it would have been obvious if not inherent to one having ordinary skill in the art at the time of the invention to measure motion of the spline curves (as taught by Setarehdan) to find the motion of the boundary (as taught by Sheehan). As the splines represent the boundary using the spline control points to measure the motion of the boundary is the simplest way to find the motion.

13. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sheehan (310) as modified by Jacob ("Robust Contour Tracking in Echocardiographic Sequences" Sixth Internation Conference on Computer Vision, Proceedings of IEEE 6th

International Conference on Computer Vision, January 4, 1998) as applied to claim 8 above, and further in view of Setarehdan (4,760,548).

In regards to claim 21, Sheehan (as modified by Jacob) discloses the method of claim 8, Jacob teaches (p. 409, Section 2.1) that a B-spline is used. Sheehan however does not disclose the number of control points needed for this B-spline for each segment.

Setarehdan teaches (col. 5, line 62 – col. 6, line 8) that four control points are used per segment for a B-spline curve.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use four control points per segment for the B-Spline curve (as taught by Setarehdan) in the method disclosed by Sheehand (as modified by Jacob). Cubic curves (four control points) are the simplest curves that can render non-planar curves (Setarehdan: col. 2, lines 2 –3). As the human heart is a three-dimension object a cubic curve would make sense, while also requiring the least possible computational power for a three-dimensional curve.

Allowable Subject Matter

14. Claims 15 and 31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

In regards to claim 15, the art of record does not teach nor does it suggest the specific features called for in the claim, particularly explicitly indicating that the average movement is weighted in favor of spline control points in the middle of each segment.

In regards to claim 31, the art of record does not teach nor does it suggest the specific features called for in the claim, particularly explicitly indicating that image features are weighted down if they imply a different between the inner and outer boundaries, which lies outside the shape-space space for that difference.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher L Lavin whose telephone number is 703-306-4220. The examiner can normally be reached on M - F (8:30 - 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh M. Mehta can be reached on (703) 308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CLL

BRIAN WERNER
PRIMARY EXAMINER